follow the high side of the tube, and a stream of air can be formed. The less the pitch of the test-tube the easier it is to maintain this stream of air. This would lead to the conclusion that in the inclined-tube design of water-tube boiler the lowest portion of the tube would be filled with water for its full area while at its highest portion the tube would have the lower part of its area filled with water and the upper part filled with steam.

In the boiler, however, the action is complicated by the bafftmg and the portion of the tube exposed to the hottest gases. With the ordinary method of baffling, used with the B. & W. type of boiler, the high end of the tubes is exposed to the hottest gases and this end, therefore, will be filled partly with steam and partly with water. When the lowest portion of the tube is exposed to the hottest gases there is a tendency for a portion of the steam generated to pass from the tube to the rear header and up to the steam drum. This action may be avoided by bushing down the rear end of the tube and in this manner increasing the velocity of the water entering to an extent that will enable it to carry the steam with it to the front header.

An experimental single-tube boiler may be extemporized from a gage glass, a wooden clamp arranged to hold the tube at various degrees of inclinations, two pieces of rubber tubing fitted to the ends of the gage glass and connecting with nozzles on the bottom of a tin pail, and a Bunsen burner or a blow torch. The pail should be partially filled with water and supported so that there is space below it to permit the gage glass to be brought nearly vertical. The heat can be applied to different parts of the water tube and held there until steam commences to form. The evidence of convection currents may be obtained by dropping a few crystals of potassium permanganate into the water

near the down leg. As these crystals slowly dissolve a stream of pink will show the direction of the current. If the water is colored a light pink, it will, in the steaming tests, permit the steam bubbles to have a higher degree of visibility. When the heat is applied at the lower end of the slightly inclined tube it will be found that a portion of the steam goes up the down leg instead of the up leg. As the inclination of the tube is increased this tendency decreases until all of the steam tends to flow to the up leg, and this greatly increases the velocity of circulation. (Note: A neat modification of this one-tube boiler has glass up legs and down legs of various